

New Australian species in the lichen genus *Siphula* Fr.

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Summary

Kantvilas, G. (2004). New Australian species in the lichen genus *Siphula* Fr. *Austrobaileya* 6 (4) 949–955. Two species of *Siphula* are described and illustrated: *S. australiensis* Kantvilas sp. nov. from the Central and Southern Tablelands of New South Wales, and *S. parhamii* Kantvilas sp. nov. from the humid wet tropics of Queensland. Their relationships with other taxa in the genus are discussed. An unusual, peltate form of *Siphula coriacea* Nyl. from Central Queensland is briefly noted and illustrated.

Keywords: lichens, lichenized fungi, *Siphula*, Australia

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Introduction

The lichen genus *Siphula* Fr. is characterised by a foliose to fruticose thallus with well-developed root-like rhizines and a green, unicellular photobiont. Ascomata are completely unknown for any species of the genus and consequently, without the benefit of characters of apothecial ontogeny, anatomy and morphology, ascus structure and ascospore morphology, the taxonomy of *Siphula* is notoriously difficult. The situation is complicated further by the broad range of morphological variation displayed by most species, often in response to subtle variations in ecological factors. The current species-level classification is based extensively on chemical composition, and correlations between this and morphology, ecology and geographical distribution; this approach has been applied to the delimitation of species from Tasmania (Kantvilas 1996, 1998) and South America (Kantvilas & Elix 2002).

The taxonomic position of the genus is still unclear although several molecular studies have indicated that the closest relatives of at least some *Siphula* species are to be found in the family Icmadophilaceae (Stenroos & De Priest 1998, Platt & Spatafora 1999), an hypothesis based on molecular data but not inconsistent with morphological, chemical and ecological information (Kantvilas 2002).

A recent world-wide review of the genus (Kantvilas 2002) recognised 23 described

species, with main centres of diversity in temperate Australasia, tropical America, southern South America, and southern Africa and the Macaronesian Islands. Several undescribed species are also known and two of these, both from mainland Australia, are described here. An unusual form of the Australasian endemic, *S. coriacea* Nyl., is also discussed briefly.

Materials and Methods

This study is based on herbarium specimens held in CANB and HO, although comparative material and types from most major herbaria have also been examined over the last decade. Thallus anatomy was studied by high-power microscopy of hand-cut sections mounted in water, 10% KOH, lactophenol Trypan Blue and ammoniacal Congo Red. Chemical composition was determined routinely via thin-layer chromatography using standard methods (Orange *et al.* 2001), with selected, critical, confirmatory analyses undertaken by Prof. J.A. Elix, Canberra, using high performance liquid chromatography (Feige *et al.* 1993).

Taxonomy

1. *Siphula australiensis* Kantvilas, sp. nov.

Aliquot similis *Siphulae decumbenti* Nyl. et item acidum thamnolicum continens sed habitu folioso, lobis late rotundatis concavisque et rhizinis sparsis differens.
Typus: Australia: New South Wales. Pigeon House Mountain, 35°21'S 150°16'E, c. 650 m altitude, on vertical rock face in a west-facing, rather moist cleft, 21 October 1999, G. Kantvilas 344/

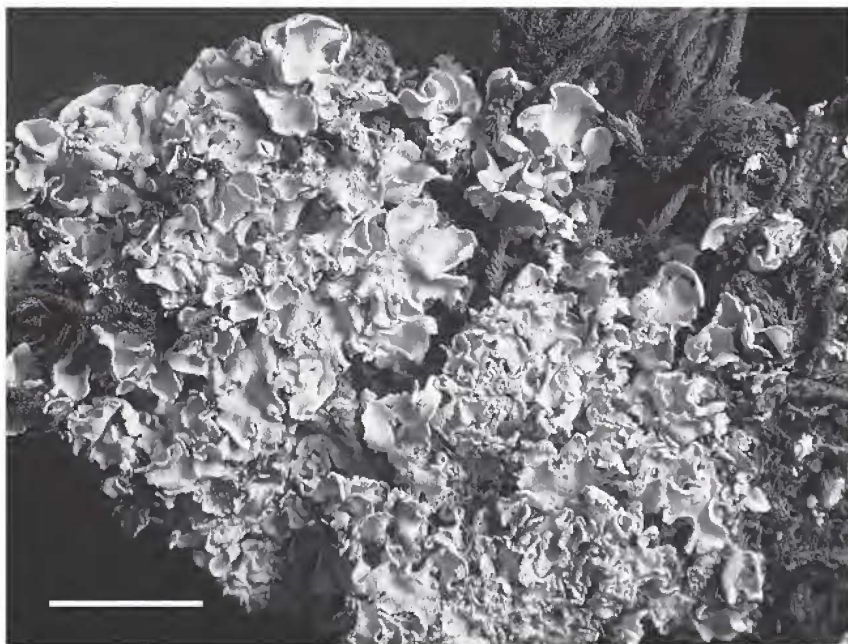


Fig. 1. *Siphula australiensis* Kantvilas (holotype). Scale = 10 mm.

99 (holo: HO; iso: GZU, NSW).

Thallus foliose, loosely attached to soil or soft sandstone. Lobes markedly flattened, decumbent, generally discrete, spreading and broadly rounded at the thallus margins, much divided, contiguous to imbricate and at times \pm erect and subfruticose in the thallus centre, undulate to concave, sometimes \pm cochleate, 1–3 (–6) mm wide, with dorsal and ventral surfaces \pm identical; surface chalky white, sometimes developing a faint beige tinge in the herbarium, generally smooth in younger parts of the thallus but becoming verrucose in older parts, very intensely and coarsely scabrid-mealy throughout; margins \pm entire or minutely and irregularly crenulate, undulate or ascending, not thickened, very brittle and frequently fractured. Thallus in section 120–230 μ m thick; well-defined cortex absent, but outermost layers of the thallus with a 10–50 μ m thick layer of tiny crystals not dissolving in KOH, visible at high-power magnification in polarised light; photobiont cells spherical, 7–13 μ m diam., irregularly clumped, especially beneath the dorsal surface of the the thallus; medullary hyphae rather loosely and irregularly

interwoven, 5–8 μ m thick, with walls to 3 μ m thick. Rhizines mostly uncommon and typically widely scattered, pale brownish, 0.25–0.5 mm thick at point of attachment. **Fig.1.**

Chemistry: thamnolic and decarboxythamnolic acids; K+ intense yellow, sometimes slowly becoming brownish red, KC-, C-, P+ orange, UV-.

Additional specimens: New South Wales. Katoomba, Mar. 1965, G.C. Bratt & J.A. Cashin 2040 (HO); Evans Lookout, c. 4 km E of Blackheath, Apr. 2002, G. Kantvilas 178/02 (HO); Pigeon House Mountain, on sandstone rock, Sept. 1977, D. Verdon 3126 (CANB); same locality and date, J.A. Elix 3930 (CANB); same locality, Nov. 2000, G. Kantvilas 488/00 (HO).

Remarks: *Siphula australiensis* is most closely related to the widespread *S. decumbens* Nyl., and both species share a chalky white thallus and thamnolic acid as the major chemical constituent. The main difference between the two taxa lies in their growth habit: foliose with spreading, generally rounded, cochleate, marginal lobes in the former, but distinctly fruticose with crowded, elongate lobes in the latter. Although *S. decumbens* is extremely variable (see Kantvilas 1998), none of the

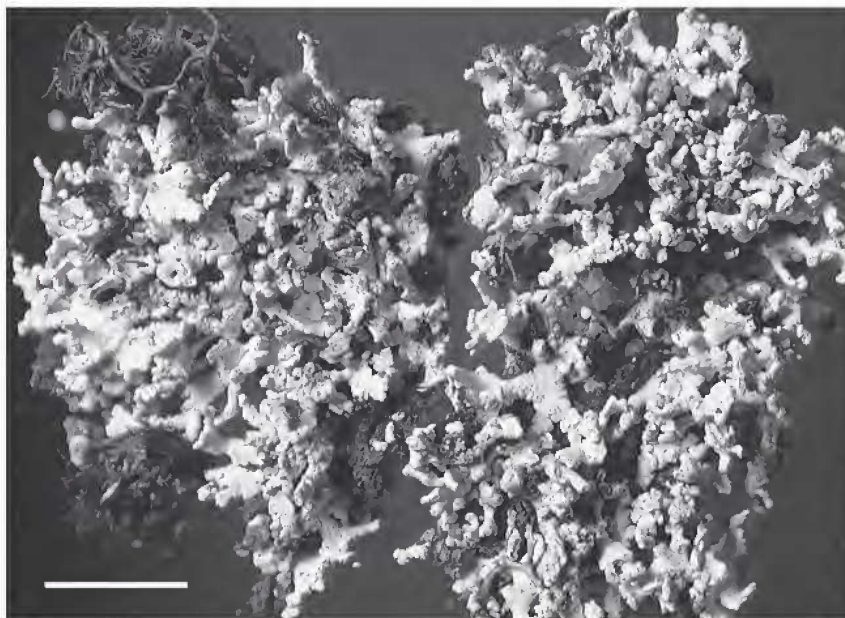


Fig. 2. *Siphula parhamii* Kantvilas (isotype). Scale = 5 mm.

material studied, encompassing a very wide range of localities and habitats, even remotely approaches the distinctive growth habit of *S. australiensis*. The differences in morphology are manifest in subtle anatomical differences. Thus in *S. decumbens*, the relatively thick medullary hyphae are periclinal whereas in *S. australiensis* they are irregular or anticlinal. Similarly the rhizines of the two species differ, with those of *S. decumbens* occurring as a thick, basal tuft, whereas those of *S. australiensis* are scattered on the ventral surface.

Perhaps the lichen that is superficially most similar to *S. australiensis* is *Icmadophila splachnirima* (Hook.f. & Taylor) D.J. Galloway, a widespread species that grows on wet peaty soil in cool to cold temperate areas of Australasia. Like *S. australiensis*, this species also has a foliose habit, rounded, often cochleate lobes and contains thamnolic acid, but the lobes are generally thinner and not markedly scabrid and mealy. The presence of pink apothecia, characteristic of the Icmadophilaceae in general, and the absence of rhizines make *I. splachnirima* easily identifiable, but the resemblance between the two species is striking and perhaps offers some insight into their relationships at a higher taxonomic rank.

Distribution and habitat: *Siphula australiensis* is locally common at the type locality and at other scattered locations on the sandstone escarpment of the New South Wales Tablelands. It grows in moist, sheltered clefts and on ledges, usually on large cliffs and bluffs. Vertical rock faces are especially favoured. That the new species is restricted to such habitats probably indicates a relict distribution in fire-protected refugia, rather than necessarily a predisposition to grow on moist, vertical rocks. In this habitat, it is typically intermixed with an algal film, small ferns and bryophytes, but other lichens with which it was associated at the type locality include *Cystocoleus ebeneus* (Dillwyn) Thwaites, *Leioderma duplicatum* (Müll. Arg.) D. J. Galloway & P.M. Jørg. and depauperate tufts of *Cladia aggregata* (Sw.) Nyl. and *Cladonia pertriosa* Kremp.

2. *Siphula parhamii* Kantvilas, sp. nov. Arcte affinis speciei austroafricanæ endemicæ *Siphulæ torulosæ* (Thunb. ex Ach.) Nyl. a qua lobis decumbentibus robustioribusque, caespes laxiores formantibus imprimis differt.
Typus: Australia: Queensland. Mt Finnigan, Mt Finnigan Range, Cedar Bay National Park, 15°49'S 145°16'E, 1090

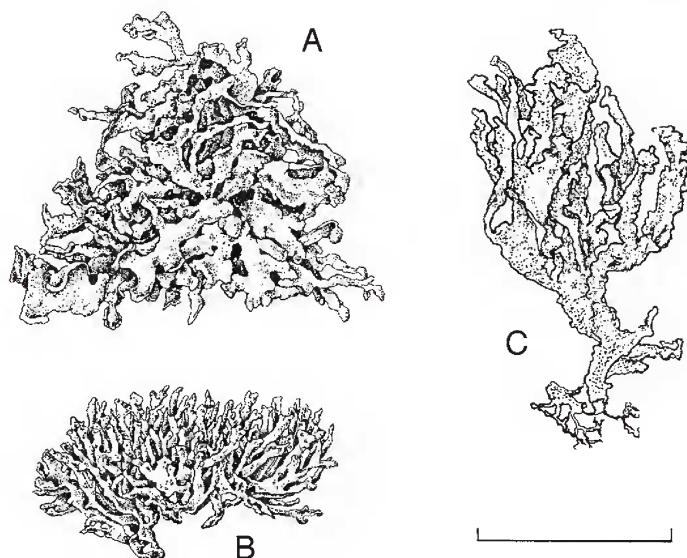


Fig. 3. Variation in baeomycesic acid and squamatic acid-containing species of *Siphula*. A: *S. parhamii* Kantvilas (part of holotype); B: *S. torulosa* (Thunb. ex Ach.) Nyl. (Brusse 2527, HO); C: *S. fastigiata* (Nyl.) Nyl. (Moscal 11956, HO). Scale = 10 mm. (A–B drawn by Lauren Black; C drawn by Georgina Davis)

m altitude, on exposed rocky ground in exposed heathy-grassy area with large rock outcrops, 20 October 1995, *H. Streimann* 57192 (holo: CANB; iso: HO).

Thallus fruticose, forming scattered or contiguous clumps mostly 10–30 mm wide over stones and gravelly soil. Lobes generally markedly flattened, decumbent, \pm discrete or, more commonly, loosely overlapping, 30–50 (–100) mm long, 0.4–1 (–1.5) mm wide, with dorsal and ventral surfaces \pm identical; surface dull whitish grey, matt, generally unevenly puckered and dimpled, neither mealy nor scabrid, patchily discoloured by a sparse to moderately dense ‘veil’ of black, unidentified fungal hyphae composed of chains of rhomboid cells 5–6 μ m wide; margins entire or irregularly crenulate, unevenly thickened in places, sometimes with knob-like projections; apices erect or ascending, sometimes with short, subterete extensions, or rather thickened and knob-like. Thallus in section 250–600 μ m thick, lacking a well-defined cortex but with a brownish grey outer layer c. 10 μ m thick; photobiont cells irregularly roundish, 8–15 μ m wide, mostly single but sometimes in pairs or tetrads to 20 μ m wide, typically concentrated in a continuous or interrupted layer beneath

the dorsal surface, sometimes also occurring in bundles through the entire thickness of the thallus or at the ventral surface; medullary hyphae periclinial, densely entwined and \pm conglutinated, 1–2 μ m thick. Rhizines pale grey-brown, c. 0.25 mm at point of attachment. **Figs 2, 3A.**

Chemistry: baeomycesic and squamatic acids; K+ pale yellowish, C–, KC–, P+ yellow-orange, UV+ pale yellow-orange with whitish patches. These two compounds appear to be irregularly distributed in the thallus, with squamatic acid mainly in the internal, medullary area and baeomycesic acid near the thallus surface. Hence, in UV light, the thallus surface appears pale orange-yellow, but abraded or fractured areas where squamatic acid containing tissues are exposed react UV+ whitish.

Additional specimen: Queensland, Mt Finnigan, on exposed boulder, Oct 1995, *H. Streimann* 57206 (CANB).

Remarks: *Siphula parhamii* is a distinctive species in the Australian flora, characterised by the relatively robust, decumbent lobes that form loose tufts, and by the presence of baeomycesic and squamatic acids. Its closest relative is *S. torulosa* (Thunb. ex Ach.) Nyl.,

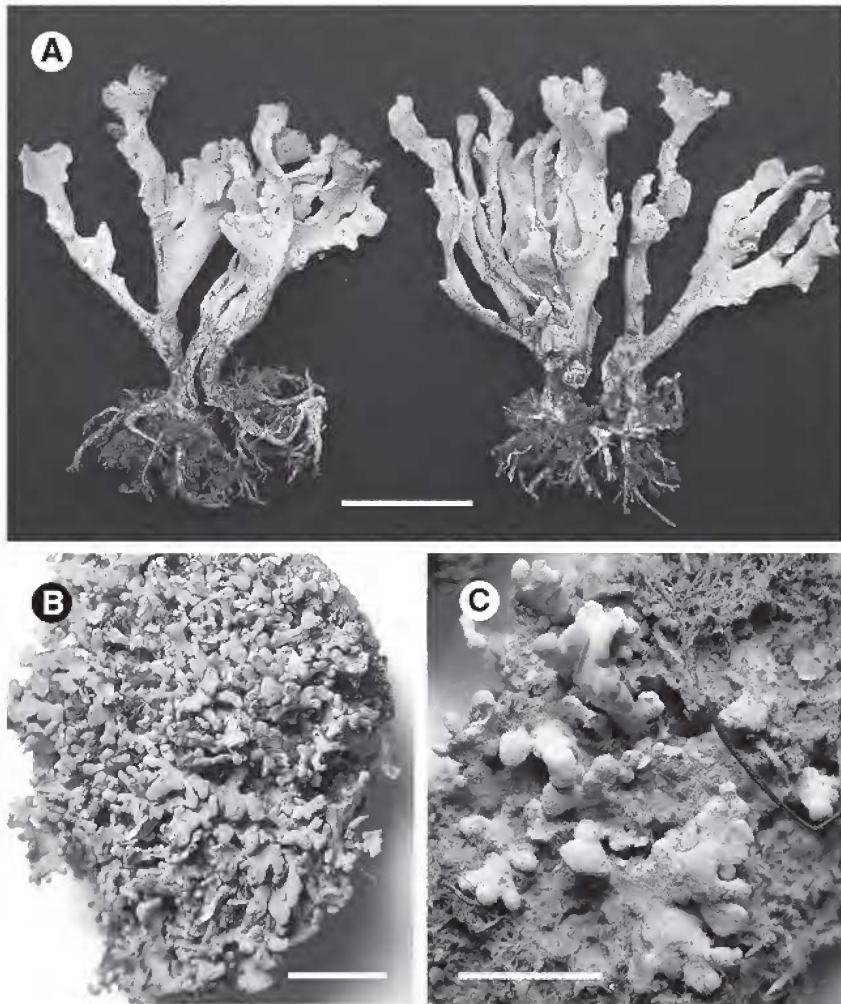


Fig. 4. Variation in *Siphula coriacea* Nyl. A: 'typical' erect form (Kantvilas & Jarman 375/92, HO); B: compact, decumbent form on rock (Bratt 67/515, HO); C: compact, flattened form on arid soil (Bratt 67/121, HO). Scales: A= 10 mm; B,C = 5mm.

endemic to the Cape region of South Africa (**Fig. 3B**). *Siphula torulosa* is chemically identical but has more slender, erect or ascending lobes, 4–12 mm tall and 0.3–0.8 mm wide, that form relatively dense tufts or swards (see also Mathey 1974). Although many species of *Siphula* are very widespread geographically and very variable morphologically (see Kantvilas 2002), *S. torulosa* is a very well-defined, localised taxon. It seems untenable to broaden its concept to include *S. parhamii*, which is localised in north Queensland and is morphologically rather extreme.

Also rather similar and chemically

identical is *S. fastigiata* (Nyl.) Nyl. This species has generally erect, strap-like, chalky white lobes with a usually scabrid, mealy, sometimes intensely puckered and verruculose surface (Kantvilas (1998) (**Fig. 3C**). It ranges from Tasmania to New Zealand, southern South America and northward into tropical America. It displays extreme morphological variation but does not encompass the distinct morphologies of *S. parhamii* and *S. torulosa* (Kantvilas 2002).

Distribution and habitat: *Siphula parhamii* is known only from the type locality, a peak in tropical north Queensland. On the basis of specimen label data, it grows in open, grassy-

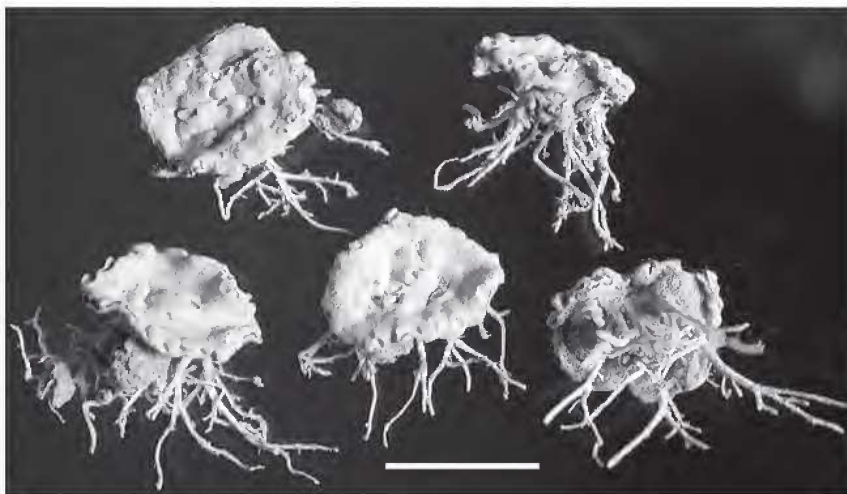


Fig. 5. An unusual peltate form of *S. coriacea* Nyl. (Purdie 4214, HO). Scale = 5 mm.

heathy vegetation, directly on rocks and on gravelly soil, intermixed with moss. The late Heinar Streimann, who collected the material, described this species as being locally abundant. It should be sought for on other peaks in the region.

Etymology: The new species is named in honour of Mr John Willoughby Parham, friend and mentor of the author, in recognition of his contributions to the Botany of Fiji, Queensland and Tasmania (see Kantvilas 2003).

An unusual form of *Siphula coriacea* Nyl.

Siphula coriacea is a very distinctive species, characterised by typically erect or ascending, flattened, distinctly bluish grey lobes containing barbatic acid. This chemical composition is unique in the genus. It is known from the mainland States of Australia and New Zealand and typically occurs on soil in heathland and grassland. As with most other species of the genus, this lichen is extremely variable, with elongate, loosely entangled, strap-shaped lobes when occurring in moister, sheltered habitats (**Fig. 4A**), but with very compact, short, convoluted lobes in drier, exposed locations such as on soil in the rangelands of the Australian interior (**Figs 4B–C**).

Two specimens, both from the same locality in Central Queensland, represent a very

unusual form of this species. They have a thallus composed of discrete, flat, peltate lobes, 2.5–8.5 mm wide, 0.5–0.85 mm thick, with a plane to undulate to rather bullate and puckered, bluish grey upper surface, recurved, \pm thickened margins, and a pale brownish underside with scattered, very prominent, white, dichotomously branched rhizines (**Fig. 5**). Although morphologically disjunct from *S. coriacea* as generally understood, these unusual specimens contain barbatic acid and are anatomically identical with *S. coriacea*: they have an epinecral layer to c. 15 μ m thick, a 'pseudocortex' to c. 60 μ m thick, composed of anticlinal hyphae c. 5 μ m thick that extend from the medulla, a photobiont layer composed of a unicellular, green alga, 6–10 μ m diam, and a medulla of irregularly interwoven hyphae, interspersed with crystals that dissolve in KOH. According to notes (by R.W. Rogers) accompanying one specimen, the collection is from microhabitats that are possibly waterlogged after rain but otherwise dry. This unusual form may be an environmental modification. Certainly given the degree to which *Siphula* species can vary in response to habitat, any taxonomic recognition of this odd form would need to be preceded by careful study of the populations in the field. 'Typical' *S. coriacea* also occurs at the same general locality.

Specimens: Queensland. Idalia National Park, c. 12 km S of Idalia homestead, on walk to Mountain Rock Hole, 24°57'S 144°47'E, 22 Sept 1992, R.W. Purdie 4214 (CANB, HO);

Idalia National Park, old Idalia homestead, 24°55'S 144°43'E, Feb 1996, R.W. Rogers 10478 (BRI).

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